

CASE REPORT

Removal of Deeply Impacted Bilateral Maxillary Canines using a New Technique of Bone Removal: Case Report and Review

¹Anjani Kumar Jha, ²Kiran Honnalingaiah

ABSTRACT

Removal of deeply impacted maxillary canine is always a challenge especially if it is lying very close to the normally erupted teeth in the arch. In this article we report a case of bilaterally impacted maxillary canines. The crown of the impacted 13 was placed labially to 12 at the level of middle 3rd of the roots of 12 and 11. The crown of impacted 23 was placed labially to 22 at the level of middle 3rd to 22. Both the impacted maxillary canines caused tipping of the roots of the lateral incisors palatally and the crown labially, making it difficult to correct orthodontically. Impacted 13 was placed horizontally along the lateral wall of the maxillary sinus with the root being curved upward and the crown lying immediately below the floor of the nose at the level of the roots of 11 and 12. Impacted 23 was placed obliquely extending between 21 and 26 with the root tip almost into the maxillary sinus. Both the impacted canines were removed under local anesthesia via an intraoral approach. No rotary instrument was used; instead the bone was removed using a Hollenback carver, a dental filling instrument. The postoperative phase was uneventful and there were no complications like oronasal/oronasal communication or injury to the normally erupted teeth and the adjacent structures.

Keywords: Cone beam computed tomography, Hollenback carver, Impacted maxillary canine.

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INTRODUCTION

An impacted tooth is one that is prevented by the soft or hard tissue to erupt into the oral cavity, beyond

chronological age with completed root formation into a normal anatomical position.¹ The four maxillary and mandibular canines, one on each side of the jaw, are the longest teeth in the mouth. They are located at the corners of the mouth. Hence, they form the cornerstones or corner pillars of the mouth. The shape of the crowns with their single pointed cusps, their locations in the mouth, and the extra anchorage furnished by the long, strongly developed roots make these canines resemble those of the carnivore. This resemblance to the prehensile teeth of the carnivore gives rise to the term "canine."²

The permanent maxillary canines are developed deep within the maxilla, complete their development late, and emerge into the oral cavity after the neighboring teeth. Due to these circumstances, eruption disturbances are common with maxillary canines than with other teeth, except for the third molars. Ectopic eruption, an orthodontic and/or surgical problem, often leads to impaction, resorption of adjacent teeth, or other complications.³

CASE REPORT

A 16-year-old female patient reported to our center for the correction of her malaligned teeth. On general examination the child was moderately built, moderately nourished. There were no signs of anemia, icterus, cyanosis, clubbing, or lymphadenopathy. Vitals were within normal limits. There was no significant medical history.

Extraoral examination revealed a symmetrical face; temporomandibular joint movements were within normal limits. Intraoral examination revealed that the patient was under orthodontic treatment for bimaxillary protrusion with class I molar relationship. During the course of the orthodontic treatment, difficulty was encountered in retracting 11, 12, and 22 (Fig. 1). Maxillary canines were missing bilaterally, there were no retained deciduous canines, there was no space in the arch for the maxillary canines, and there was no loosening of the maxillary lateral incisors. The only problem was that the lateral incisors were buccally placed, which could not be corrected orthodontically.

Radiological examination using cone beam computed tomography (CBCT) revealed the following:

- Horizontally impacted 13 with the root tip starting at the level of 16 region lying within the maxillary sinus

¹Associate Professor, ²Reader

¹Department of Dental Surgery, Major SD Singh Medical College and Hospital, Farrukhabad, Uttar Pradesh, India

²Department of Orthodontics and Dentofacial Orthopaedics RajaRajeshwari Dental College and Hospital, Bengaluru Karnataka, India

Corresponding Author: Anjani Kumar Jha, Associate Professor Department of Dental Surgery, Major SD Singh Medical College and Hospital, Fategarh, Farrukhabad, Uttar Pradesh, India Phone: +919939189470, +918539951446, e-mail: anjansmile@rediffmail.com



Fig. 1: Intraoral view of the occlusion

and the apical 3rd of the root was curved in a superior direction. The crown of impacted 13 was close to the labial cortical plate and was placed labially to 12 at the level of middle 3rd of the roots of 12 and 11 (Fig. 2).

- Impacted 23 extended from 21 to 26. The crown of 23 was very close to the labial cortical plate at the 21 and 22 regions and was placed labially to 22 at the level of middle 3rd to 22 pushing the root of 22 palatally and labial tipping of the crown of 22. The root tip of 23 was in the maxillary sinus and was placed at a higher level from the root of 25 and 26 (Fig. 3).

Hence a diagnosis was made of the horizontally impacted 13 and obliquely impacted 23 pushing the root of 12 and 22 palatally with roots of both the teeth lying in the maxillary sinus. As it was not possible to move the impacted 13 and 23 orthodontically into its normal anatomical place and also the impacted 13 and 23, which were pushing over the roots of 12 and 22 respectively, causing an orthodontic failure to move 12 and 22, it was decided that the impacted 13 and 23 should be removed.

The patient was taken up for surgery under proper aseptic conditions. Bilateral infra-orbital nerve block

was given followed by local infiltration both labially and palatally in the 22, 23, and 24 regions. A vestibular approach was used bilaterally to expose the anterior wall of the maxilla. No rotary instrument was used as the impacted canines were placed very close to the erupted teeth, so as to avoid injury to their roots. Instead a Hollenback carver, a dental filling instrument, was used to remove the bone around the impacted canines to expose them. After exposing the canines they were elevated out using an elevator, taking care not to injure the other erupted teeth (Figs 4 and 5). Hemostasis was achieved and primary closure of the wound was done bilaterally using 3-0 black silk. Postoperative healing was uneventful; sutures were removed on the 7th postoperative day.

DISCUSSION

Mineralization of the canine crown starts at 4 to 12 months of age and completes at 6 to 7 years of age. At the time of eruption, an expansion of the gubernacular canal takes place. The tooth germs are usually in close contact with the apices of the primary canine as well as the lateral incisor and/or the first premolar.³ During eruption, the canine moves down along the distal aspect of the lateral incisor root in very close contact with it. It has been found that the lamina dura of the lateral incisor facing the erupting canine is frequently missing during their phase of eruption. Due to their close contact the lateral incisor may tip temporarily distally when the canine crown is situated in the apical region and exerts pressure there.³ As the canine crown passes the mid portion of the lateral incisor root and erupts more coronally, these teeth become spontaneously upright. In a clinical study it has been found that the distal tipping of a maxillary lateral incisor increases from a few percentages in 8-year-old to 10% in 9-year-old and reaches 21% in 10-year-old. By the age of 11 years much displacement is rarely seen.³ In our case, displacement of the lateral incisor was present even after the age of

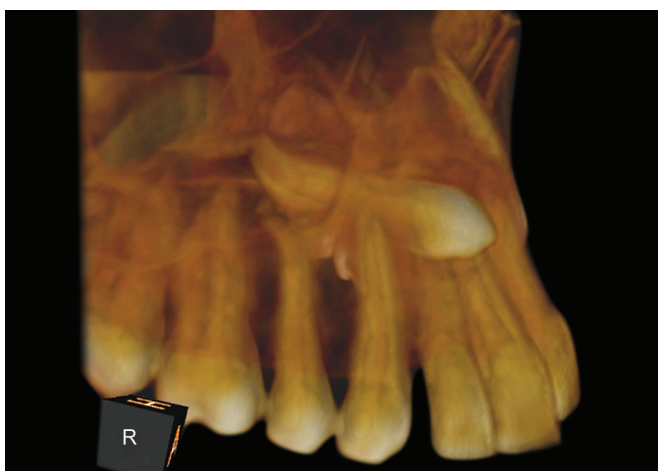


Fig. 2: CBCT showing impacted 13

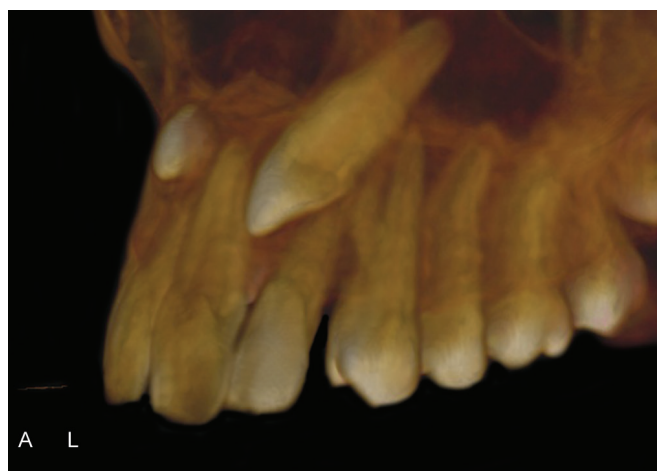


Fig. 3: CBCT showing impacted 23



Fig. 4: Impacted tooth being exposed after bone removal using Hollenback carver



Fig. 5: Impacted tooth finally being elevated out using fine elevator

16 years; the impacted 13 and 23 were in close contact with the apical 3rd of the root of the lateral incisor, causing the tipping of the lateral incisors.

Clinically in the buccal surfaces, a palpable bulge along the alveolar process distal to the lateral incisor indicates a normally erupting canine about 1 to 1½ years before its emergence.^{3,4} In our case the patient was 16 years of age, there was no over-retained deciduous upper canines, and the bulge was found apical to the lateral incisor at the region of the nasal floor.

In an American study, maxillary canine emergences have been found to take place at a mean age of 12.3 years for girls and 13.1 years for boys. In a Swedish study, the mean eruption time in girls was 10.8 years and in boys 11.6 years. In Japanese children, the mean eruption time for girls and boys were found to be somewhat earlier, 10.34 and 10.8 years respectively.³ In our case, the patient was a 16-year-old female who had bilateral impacted canines.

Ericson and Kuroi found that more mesially positioned canine cusp tips are associated with greater resorption of the lateral incisor roots. Arch crowding can also have a significant influence; moderate to severe crowding indicates the need for surgical exposure and complex orthodontic treatment to resolve the impaction and malocclusion.⁵ In our case, though the cusp tips of the impacted canines were mesially positioned, no resorption of the roots of the lateral incisor was found. There was no arch crowding and no retained deciduous canines. The patient presented only with bimaxillary protrusion.

INCIDENCE

Pseudoanodontia or impacted teeth occurs most frequently with mandibular 3rd molars, followed by maxillary canines and less frequently by premolars and mandibular canines.⁶ In a study of 3,874 routine full-mouth radiographs of patients over the age of 20, Dachi and Howell⁷ found 16.7% had at least one

impacted tooth. The incidence of impacted maxillary and mandibular 3rd molars were found to be approximately 22 and 18%, respectively. Impacted maxillary canine was reported in 0.92% cases and most of these were found to be unilateral. The occurrence was two times more frequent among females (1.17%) than males (0.51%). The next most commonly impacted permanent tooth was the mandibular premolar (0.4%), followed by the maxillary premolar (0.13%) and the mandibular canine (0.09%). This order is in contrast to that reported by Moyers, who stated that the teeth most frequently found to be impacted were the mandibular 3rd molar, maxillary cuspids, maxillary 3rd molar, mandibular and maxillary second bicuspid, and the maxillary central incisor, in that order.⁸ Thilander and Myrberg found that impacted maxillary canines occur in approximately 2.0% of the general population and mandibular canine impactions in approximately 0.2%.⁹ Rohrer reported the incidence of permanent canine impactions to be 20 times higher in the maxilla than in the mandible.¹⁰ Among patients having maxillary canine impactions, palatally displaced canines occur three times more frequently than those found buccally.^{9,11,12} Hitchin¹³ and Rayne¹⁴ found that palatal impactions account for 85% and labial impactions for 15%. Our patient had bilaterally impacted maxillary canines, which is a less common finding. Both canines were labially placed, which is again uncommon.

ETIOLOGY

Canine impactions are believed to occur with a wide variety of systemic and local etiologies, which could be space loss, ectopic position of tooth germ, delayed resorption of the primary canine, lack of guidance from gubernacular canal, root tip deflection, hereditary causes, congenitally missing lateral incisors, space augmentation, dental follicular changes, obstructed eruption path, cleft lip and palate deformity, and rarely trauma.^{3,4,15}

No single etiology has been shown to explain the occurrence of a majority of impactions or to allow a differential explanation of those occurring either labially or palatally.⁴ Environmental factors may contribute to this anomaly during the long, tortuous eruption path of a canine. Another possible explanation is that a disturbance associated with the follicle of the unerupted tooth may influence the direction of eruption and contribute to the displacement of the maxillary canine.¹⁶ Jacoby¹⁷ cites clinical observations in which of the 46 maxillary unerupted canines requiring surgical exposure for orthodontic traction, 40 were palatally placed and 6 were labial. Of these, he stated, 85% of the palatally impacted canines had sufficient space for eruption in the dental arch. He also stated that it is impossible to imagine that in an arch length deficiency and maxillary canine will “jump” on the lingual side, behind the lateral incisor or the first premolar. The maxillary canine is surrounded by the nasal cavity, the orbit, and the anterior wall of the sinus, located in contact with the crowns and the roots of the lateral incisor, the first premolar, and the deciduous canine. Thus, if the maxillary canine is impacted due to arch length deficiency, it can only be on the labial side because developmentally it is labially posed. Jacoby further suggested that the explanation for palatal impaction could be excessive space in the canine area.¹⁷ This excessive space would allow the canine to move palatally in the bone and find a place behind the buds of the other teeth. Miller reported a high incidence of impacted canines associated with small, peg-shaped lateral incisors.¹⁸ Becker et al suggested that canine impaction can be explained by the lack of guidance for the roots of the lateral incisors during the early stages of canine eruption.¹⁹ On the contrary, canine impactions were found to occur in families, suggesting a genetic or familial pattern of inheritance. Peck and Peck suggested a multifactorial genetic pattern of inheritance for the anomaly.²⁰

Shafer et al²¹ suggested the following sequelae for canine impaction.

- Labial or lingual malpositioning of the impacted tooth
- Migration of the neighboring teeth and loss of arch length
- Internal resorption
- Dentigerous cyst formation
- External root resorption
- Infection particularly with palatal eruption
- Referred pain
- Combinations of the above sequelae.

Various radiographic evaluation required for the diagnosis and management of impacted canine are IOPA X-ray consisting of tube shift technique or Clark’s technique and buccal object rule, occlusal films, extraoral films consisting of frontal and lateral cephalograms, panoramic films, and CT scan.²² In our case CBCT was used.

Various indications for the removal of impacted canines are, before the fitting of full or partial dentures and before construction of a bridge: To permit orthodontic alignment of other anterior teeth, in cases of resorption of the root of an adjacent lateral or central incisor, and where a follicular cyst has developed.^{3,4,23,24} Contraindications are when the cuspid can be brought into the normal position either by surgical positioning or by a combination of surgery and orthodontia at an early age, when the patient is symptomless and has no functional or esthetic problems or does not desire the removal of the tooth.

Factors that complicate the removal of impacted maxillary cuspids are the usual proximity of impacted cuspid to the adjacent teeth (central, lateral, and bicuspids); there is a greater danger of injury to the adjacent teeth and vital structures in the area of surgery. In greater percentages of these impactions, the root portion is separated from the maxillary sinus and nasal cavity by a thin partition of bone, and in some cases solely by the ciliated epithelial lining of the maxillary sinus. For these reasons, the possibility of forcing the cuspid root into the maxillary sinus during sectional removal of impacted cuspid is always present. Not infrequently, openings of various sizes into the maxillary sinus are created.

The impacted cuspids are exposed by removing the bone using a spear-pointed drill, or bone bur, being careful not to damage the roots of the adjacent teeth. By means of a bur or a chisel and a mallet, connect the drilled holes around the crown of the impacted tooth and remove the bone overlying the crown. Enlarge the size of the opening with burs so that the complete crown may be seen. The exception to this rule is a case in which a portion of the crown of the impacted tooth is in contact with the roots of the upper central or lateral incisors or bicuspids; if the roots of these teeth are exposed, they will be damaged. In these cases, enlarge the opening on the opposite side of the crown by means of bone burs or cut the crown from the root. In our case the impacted canines were very close to the root of the lateral incisors; a new technique of bone removal using a Hollenback carver, a dental filling instrument, was used (Fig. 6). Maxillary bone is porous and not as hard as the mandibular bone; hence this carver was good enough to remove the maxillary bone with much ease. The advantages of using this instrument were as follows:

- No heat was produced, as in the case of bone drills.
- No irrigation was required as in cutting the bone using bone drills.
- It was clear surgical field because of less hemorrhage and nil irrigation.
- There was no requirement of high-pressure suction, thus reducing tissue dehydration and avoiding injury to the maxillary sinus, nasal floor, and vital structures in and around the surgical site.



Fig. 6: Hollenback carver, a dental filling instrument

- No injury was caused to the roots of the adjacent teeth.
- Minimal bone removal was involved.
- The time taken for the surgical procedure was much less.
- Reduced postoperative pain and swelling was experienced as compared to bone removal done using a bone drill.

CONCLUSION

Maxillary canines are the most commonly impacted teeth after the mandibular third molars. They are important both functionally and esthetically. Hence, they should always be retained as far as possible. In our case, the bilaterally impacted canines were deeply seated in an unfavorable position for its eruption or orthodontic retraction. Further, there was no space for them in the dental arch. The impacted maxillary canines were pushing over the erupted lateral incisors, causing labial tipping of the crown of the lateral incisors, which could not be corrected by orthodontic treatment. After orthodontic and radiologic evaluation, it was decided that the bilaterally impacted maxillary canines be surgically removed. No bone drill was used since the impacted canines were in close approximation to the lateral incisors, so as to prevent the damage to the lateral incisors and also to prevent perforation of the maxillary sinus or the floor of the nose. Instead the impacted canines were uncovered by removing the bone using a Hollenback carver, a dental filling instrument, and the impacted canines were delivered using a fine elevator with much ease. There was neither any injury to the roots of the normally erupted teeth nor any oroantral or oronasal communication created. To conclude, Hollenback carver is a very effective instrument that can be used for bone removal in the maxilla without the fear of injury to the adjacent teeth due to direct injury or production of unwanted heat and also prevents any oroantral or oronasal communication specially in cases where the impacted teeth are very deeply placed within the maxilla and in close approximation with the roots of the normally erupted teeth.

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